OIPE JC17
SEP 15 2004
PATENT & TRADEMARK OFFICE

FIG. 1

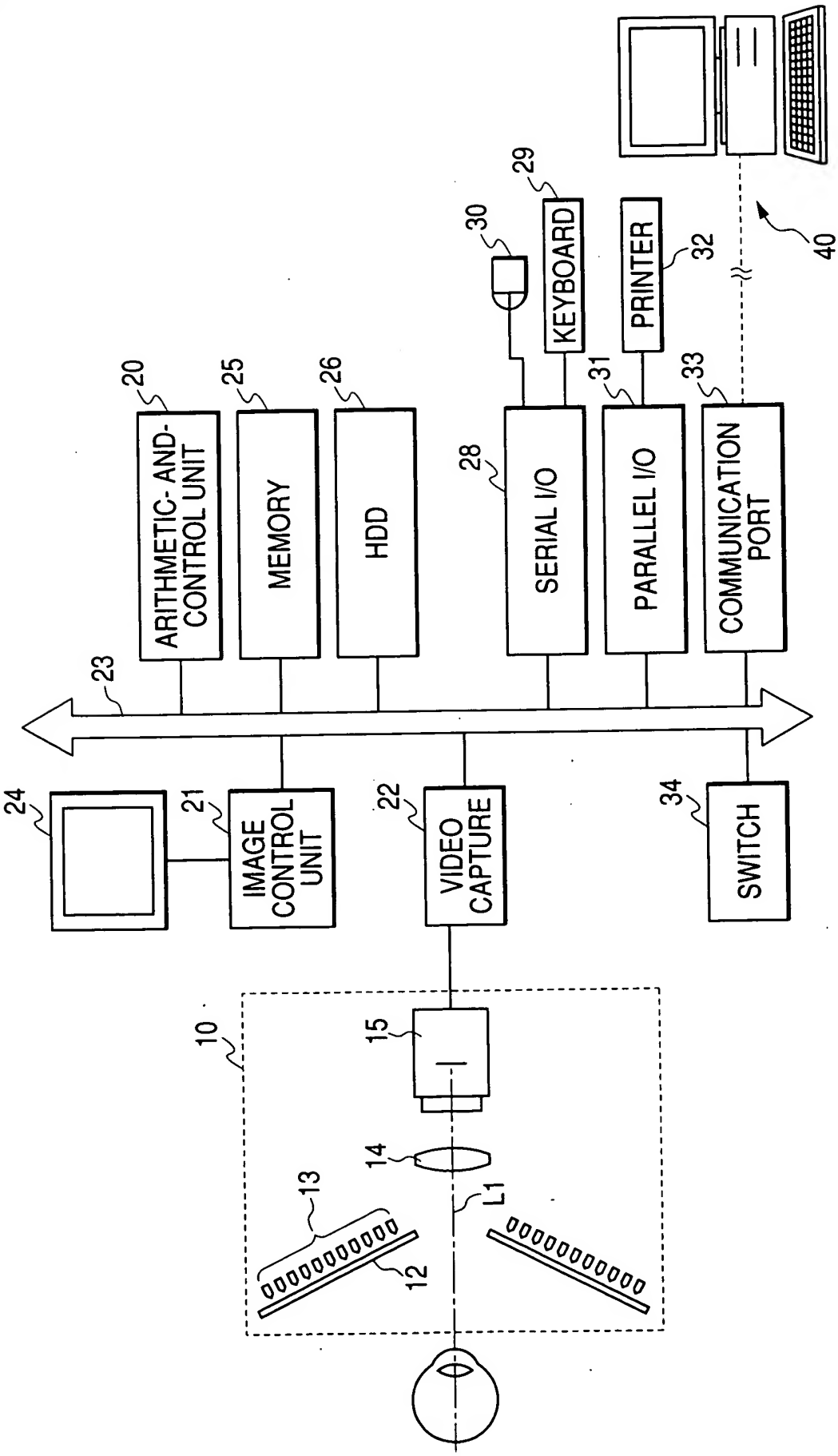

FIG. 2

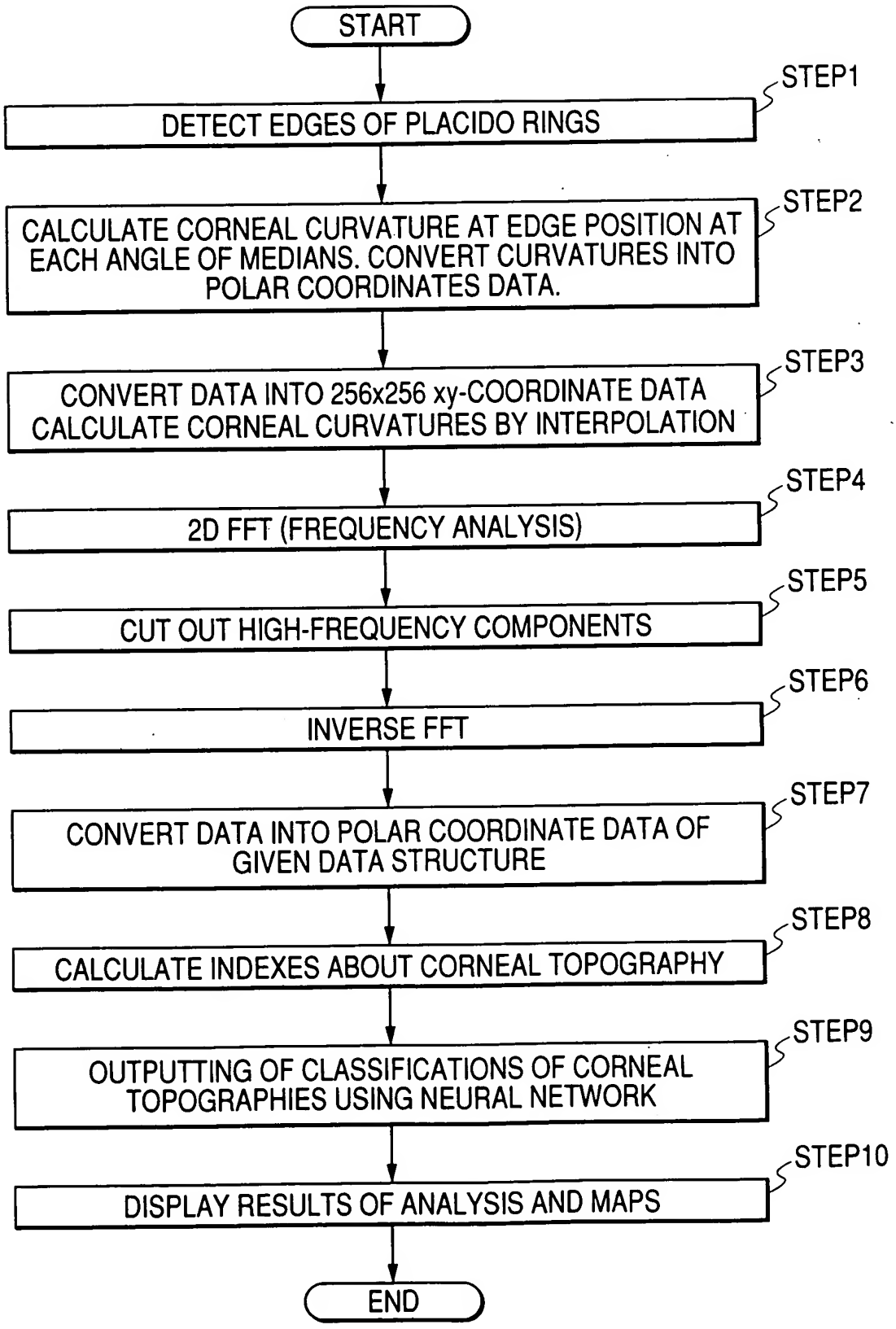
START
STEP1
DETECT EDGES OF PLACIDO RINGS
STEP2
CALCULATE CORNEAL CURVATURE AT EDGE POSITION AT EACH ANGLE OF MEDIANS. CONVERT CURVATURES INTO POLAR COORDINATES DATA.
STEP3
CONVERT DATA INTO 256x256 xy-COORDINATE DATA CALCULATE CORNEAL CURVATURES BY INTERPOLATION
STEP4
2D FFT (FREQUENCY ANALYSIS)
STEP5
CUT OUT HIGH-FREQUENCY COMPONENTS
STEP6
INVERSE FFT
STEP7
CONVERT DATA INTO POLAR COORDINATE DATA OF GIVEN DATA STRUCTURE
STEP8
CALCULATE INDEXES ABOUT CORNEAL TOPOGRAPHY
STEP9
OUTPUTTING OF CLASSIFICATIONS OF CORNEAL TOPOGRAPHIES USING NEURAL NETWORK
STEP10
DISPLAY RESULTS OF ANALYSIS AND MAPS
END

FIG. 3(a)

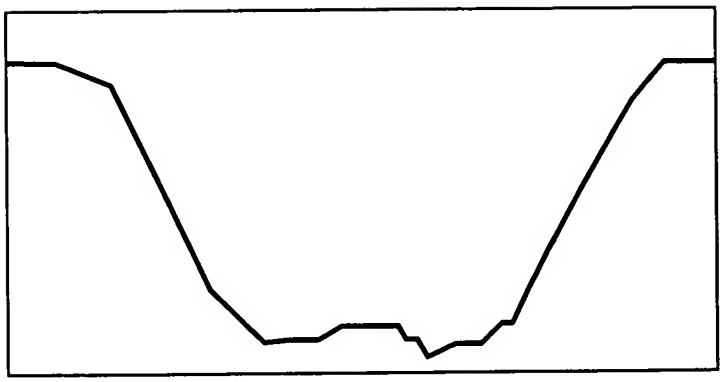

FIG. 3(b)

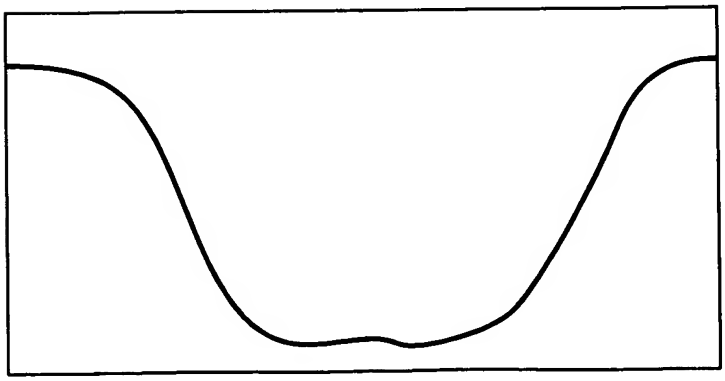

FIG. 4

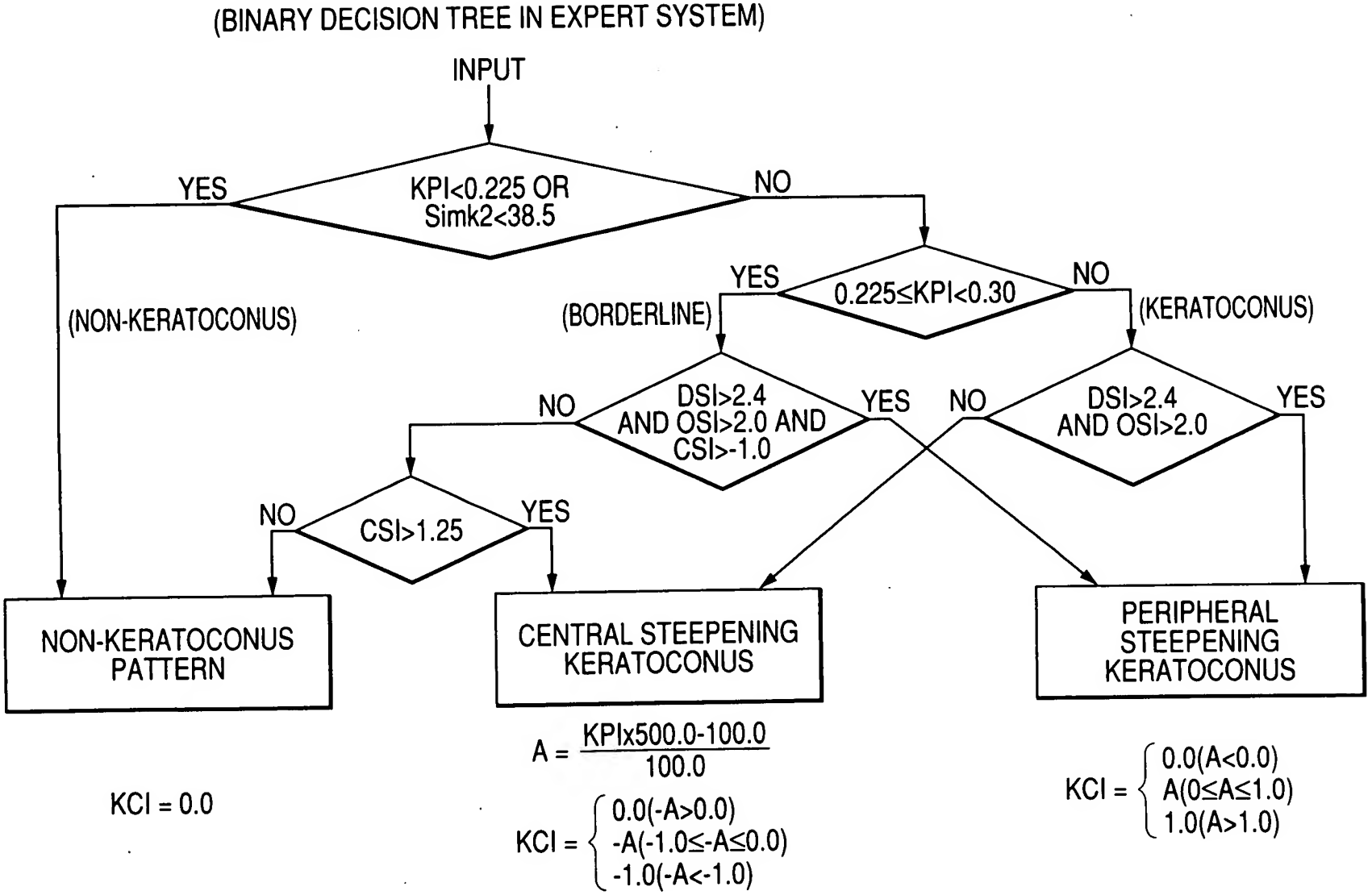
(BINARY DECISION TREE IN EXPERT SYSTEM)
INPUT
KPI<0.225 OR Simk2<38.5
YES
NO
(NON-KERATOCONUS)
0.225≤KPI<0.30
YES
NO
(BORDERLINE)
(KERATOCONUS)
DSI>2.4 AND OSI>2.0 AND CSI>-1.0
NO
YES
DSI>2.4 AND OSI>2.0
NO
YES
CSI>1.25
NO
YES
NON-KERATOCONUS PATTERN
CENTRAL STEEPENING KERATOCONUS
PERIPHERAL STEEPENING KERATOCONUS
KCI = 0.0
A = KPIx500.0-100.0 / 100.0
KCI = 0.0(-A>0.0); -A(-1.0≤-A≤0.0); -1.0(-A<-1.0)
KCI = 0.0(A<0.0); A(0≤A≤1.0); 1.0(A>1.0)

FIG. 5

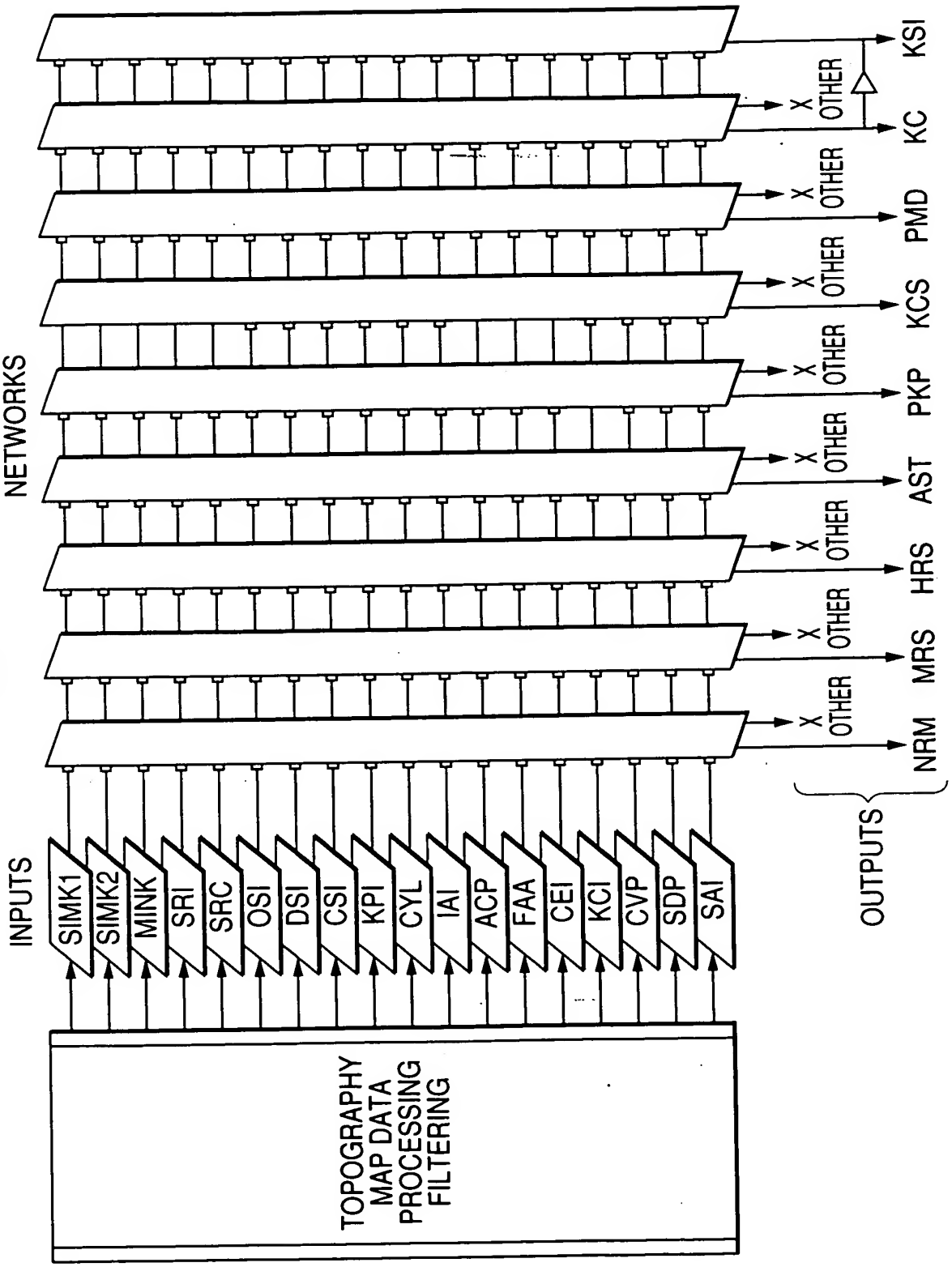
INPUTS
SIMK1
SIMK2
MINK
SRI
SRC
OSI
DSI
CSI
KPI
CYL
IAI
ACP
FAA
CEI
KCI
CVP
SDP
SAI
TOPOGRAPHY
MAP DATA
PROCESSING
FILTERING
NETWORKS
OUTPUTS
NRM
MRS
HRS
AST
PKP
KCS
PMD
KC
KSI
OTHER

FIG. 6

Graph

	0% 25% 50% 75% 100%
NRM	0.0%
AST	0.0%
KCS	0.0%
KC	99.4% KSI=93.04%
PMD	0.0%
PKP	0.1%
MRS	0.2%
HRS	0.0%
OTH	0.3%

Statistics

SRI	1.94	ACP	54.86
SIMK1	61.86	IAI	0.71
SIMK2	54.07	FAA	74.96
MINK	52.03	KCI	1.00
OSI	13.46	CVP	194.78
DSI	22.12	SDP	9.88
CSI	5.93	SAI	3.62
KPI	0.54	CEI	1.32
CYL	6.32	SRC	1.84

FIG. 7

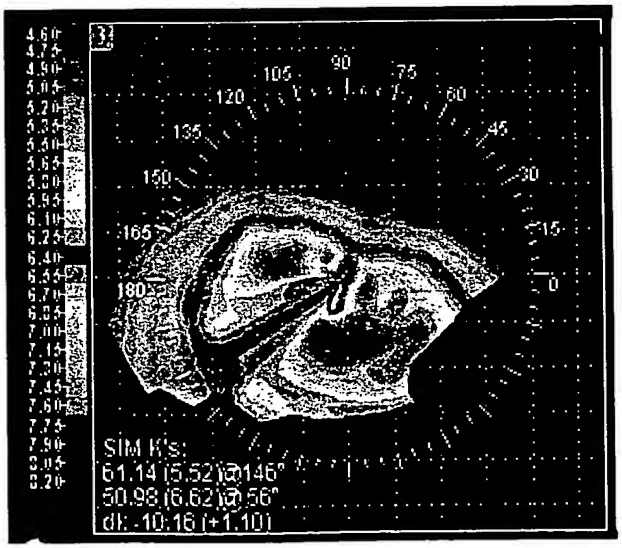

FIG. 8

KSI = 0.0069 (SIMK1) + 0.0016 (OSI) + 0.0220 (SRI) + 0.0055 (DSI) + 0.0091 (MINK) + -0.0225 (KPI) + 0.0087 (CYL) + 0.0144 (IAI) + -0.0009 (CSI) + -0.0137 (SAI) + 0.0489 (SDP) + 0.0073 (ACP) + -0.0032 (CEI) + 0.0224 (SRC) + 0.0243 (SIMK2) + 0.0257 (CVP) + -0.0737 (FAA) + 0.0071 (KCI)

KCS = -0.2536 (OSI) + 0.6255 (DSI) + 0.6087 (KPI) + 0.0262 (CYL) + 0.1073 (IAI) + 0.5513 (CSI) + 0.4107 (SAI) + -0.2324 (SDP) + -0.1727 (CEI) + -0.5790 (CVP) + 0.0054 (KCI)

PMD = 0.1244 (SIMK1) + 0.1081 (OSI) + 0.0785 (SRI) + 0.0725 (DSI) + 0.0452 (MINK) + 0.0393 (KPI) + 0.0386 (CYL) + 0.0167 (IAI) + 0.0003 (CSI) + -0.0035 (SAI) + -0.0153 (SDP) + -0.0221 (ACP) + -0.0321 (CEI) + -0.0681 (SRC) + -0.0762 (SIMK2) + -0.1198 (CVP)

PKP = 0.0866 (SIMK1) + 0.0302 (OSI) + -0.0006 (SRI) + 0.0028 (DSI) + -0.0314 (MINK) + 0.0583 (KPI) + 0.0021 (CYL) + 0.1338 (IAI) + -0.0459 (CSI) + -0.0156 (SAI) + -0.0294 (SDP) + -0.0155 (ACP) + 0.0183 (CEI) + -0.0121 (SRC) + 0.0029 (SIMK2) + -0.0451 (CVP) + -0.0033 (FAA)

NRM = -0.1650 (SIMK1) + -0.0141 (OSI) + -0.0519 (SRI) + -0.2721 (DSI) + 0.0299 (MINK) + 0.2572 (KPI) + -0.3062 (CYL) + 0.0255 (IAI) + 0.1941 (CSI) + -0.2009 (SAI) + -0.3098 (SDP) + -0.1189 (ACP) + 0.1186 (CEI) + -0.0528 (SRC) + -0.0622 (SIMK2) + -0.3062 (CVP) + -0.0764 (FAA) + -0.1250 (KCI)

MRS = -0.0359 (SIMK1) + 0.0333 (OSI) + -0.0037 (SRI) + -0.0078 (DSI) + 0.0048 (MINK) + 0.3986 (KPI) + -0.0508 (CYL) + 0.0273 (IAI) + -0.0286 (CSI) + 0.0046 (SAI) + 0.0369 (SDP) + -0.0037 (ACP) + -0.0706 (CEI) + 0.0567 (SRC) + 0.0039 (SIMK2) + -0.0060 (CVP) + 0.0351 (FAA) + -0.0227 (KCI)

KC = 0.1655 (SIMK1) + 0.0585 (OSI) + -0.1228 (SRI) + 0.0637 (DSI) + 0.0210 (MINK) + 0.1189 (KPI) + 0.0416 (CYL) + -0.1346 (IAI) + 0.1096 (CSI) + 0.0809 (SAI) + 0.0325 (SDP) + 0.0667 (ACP) + -0.0499 (CEI) + -0.0257 (SRC) + -0.0853 (SIMK2) + 0.0298 (CVP) + -0.0237 (FAA) + 0.0096 (KCI)

HRS = -0.1336 (SIMK1) + -0.1360 (OSI) + -0.1332 (SRI) + 0.2551 (DSI) + 0.2585 (MINK) + -0.1508 (KPI) + -0.4129 (CYL) + 0.1856 (IAI) + -0.2606 (CSI) + -0.2394 (SAI) + -0.0501 (SDP) + -0.1463 (ACP) + 0.2777 (CEI) + 0.2931 (SRC) + 0.1321 (SIMK2) + -0.0815 (CVP) + 0.1675 (FAA) + -0.1375 (KCI)

AST = 0.0051 (SIMK1) + -0.0042 (OSI) + -0.0012 (SRI) + 0.0022 (DSI) + 0.0034 (MINK) + -0.0057 (KPI) + 0.0031 (CYL) + -0.0029 (IAI) + 0.0013 (CSI) + -0.0041 (SAI) + -0.0054 (SDP) + 0.0022 (ACP) + 0.0039 (CEI) + -0.0050 (SRC) + 0.0028 (SIMK2) + -0.0054 (CVP) + 0.0021 (FAA) + -0.0012 (KCI)